Remarks

The paragraph beginning on line 13 of page 4 of the specification is currently amended to reflect the filing dates and correspondingly assigned serial numbers of each of the mentioned patent applications.

Claims 1-32 were originally filed in this application.

No claims have been canceled. No new claims are added.

No claims are currently amended.

As a result, claims 1-32 remain pending for examination, with claims 1, 6, 18, and 28 being independent claims.

Replacement drawings (FIGS. 1-6, 6 sheets) are filed herewith to replace the original drawings.

No new matter has been added with any of the amendments or replacement drawings.

Rejections Under 35 U.S.C. § 103

Claims 1-32 are rejected under 35 U.S.C. § 103(a) as would have been obvious over the teaching of Sato in European Patent No. EP 1 172 145 B1 (hereinafter "Sato") in view of the teaching of Briggs in U.S. Patent No. 2,535,035 (hereinafter "Briggs") and the teaching of Bianchi *et al.* in U.S. Patent No. 4,830,732 (hereinafter "Bianchi *et al.*").

Applicants disagree that the respective subject matter of each of claims 1-32 would have been obvious over the teaching of Sato in view of the teachings of Briggs and Bianchi *et al.* The rejection is improper because none of the references teaches or suggests each and every claimed element, alone or in combination. Indeed, the alleged *prima facie* case of obviousness is also improper because one skilled in the art would not have had any reasonable expectation that the alleged combination would be successful.

Sato teaches an electrodeionization apparatus and its method of operation and, in particular, teaches limiting the diffusion of silica from concentrating compartments of the device to produce product water with low silica concentration. The disclosed apparatus and method involves limiting the concentration of silica in water leaving from the concentrating compartment of the device to less than 100 ppb, preferably, to less than 70 ppb. (Sato at paragraphs [0006] to [0010].)

Briggs teaches a method of electrolytic water softening and pH adjustment and, in particular, teaches a method and a means of reducing the amount of waste solution involved in electrolytic water softening and, at the same time, serves to increase the efficiency of the electrolytic influence. (Briggs at column 1, lines 6 *et seq.*) The disclosed electrolytic cell has a cathode chamber 3 and an anode portion separated therefrom by a porous diaphragm 5. A partition 6 divides the anode portion into two sections; anode section 4 and anodic chamber 24. (Briggs at column 2, lines 10 *et seq.* and at FIG. 1.) During operation of the electrolytic cell, raw, hardness-containing water is introduced into the cathode chamber 3; the majority of the water flows through the cathode chamber 3 where it becomes alkalized due to electrolytic influence and, consequently, considerable quantities of the hardness components therein can precipitate. (Briggs at column 2, lines 10 *et seq.*) The precipitate-containing water flowing out of the cathode chamber 3 is directed to a settling tank 8 wherein the precipitate is removed. Overflow from the tank 8 is passed through a sand filter 9 for clarification before being directed into the anodic chamber 24 of the anode portion where the pH of the water is reduced to a desired level before being discharged as a finished water product through line 12. (Briggs at column 2, lines 23 *et seq.*) An alkalizing agent, such as milk of lime, is added to the solution recirculating to and from anode section 4 thereby forming a precipitate that is removed after setting in a tank 15. An amount of solution can be discarded through an overflow line 18 from tank 15. Raw water can be introduced into the recirculating solution as make-up water through a control device 2. If an alkalizing agent is not utilized, a portion of the recirculating acidic solution can be removed from the tank 15 through the overflow line 18. An assembly of two

compartment cells may be utilized in a similar manner. (Briggs at column 3, lines 61 *et seq.* and at FIG. 3.)

Bianchi *et al.* disclose an electrochemical deoxygenation process for corrosion control in deionized water with a membrane electrolyzer. (Bianchi *et al.* at Abstract.) The electrolyzer has electrolytic cells 1 defined by end-plates B. The cell 1 is separated into an anode compartment and a cathode compartment by a membrane M. The anode compartment has an anode A which supports the membrane M. (Bianchi *et al.* at column 3, lines 1 *et seq.* with reference to the schematic illustration of FIG. 1) The cathode compartment comprises a cathode C and a distributor D, which presses the cathode C against the membrane M. (Bianchi *et al.* at column 3, lines 27 *et seq.*) During operation, deionized water is fed into the cathode compartment and a cathodic reaction reduces oxygen dissolved in the water. (Bianchi *et al.* at column 4, lines 1 *et seq.*) A 70 % reduction of the oxygen content of a deionized water was achieved. (Bianchi *et al.* at Example 1.)

The subject matter of independent claim 1 would not have been obvious over the teaching of Sato in view of the teaching of Briggs and Bianchi *et al.* because none of the references teaches a water purification apparatus comprising a cathode compartment, an anode compartment, and at least one ion-depleting compartment, at least a portion thereof positioned between the cathode compartment and the anode compartment, and fluidly connected to the ion-depleting compartment.

The subject matter of independent claim 6 would not have been obvious over the teaching of Sato in view of the teaching of Briggs and Bianchi *et al.* because none of the references teaches a method of purifying a fluid comprising passing a portion of a first fluid through an ion-depleting compartment of an electrochemical device to produce a second fluid, and passing at least a portion of the second fluid through a cathode compartment of the electrochemical device.

The subject matter of independent claim 18 would not have been obvious over the teaching of Sato in view of the teaching of Briggs and Bianchi *et al.* because none of the references teaches a method of purifying water comprising passing a portion of a first water stream through a cathode compartment of a water purification apparatus to produce a second

water stream, and passing at least a portion of the second water stream through an ion-depleting compartment to produce purified water.

The subject matter of independent claim 28 would not have been obvious over the teaching of Sato in view of the teaching of Briggs and Bianchi *et al.* because none of the references teaches a method comprising passing a first portion of a fluid through an ion-concentrating compartment of an electrochemical device to produce a second fluid, passing a second portion of the first fluid through an ion-depleting compartment of the electrochemical device to produce a third fluid, reducing the pH of the second fluid, and reducing the corrosiveness of the third fluid.

A person of ordinary skill in the art would not have turned to the teaching of Bianchi *et al.* to modify the teaching of Briggs or Sato. As noted above, Bianchi *et al.* seeks to remove dissolved oxygen from a deionized water stream by regulating an applied current and/or potential to an electrolyzer to a level that promotes reaction of the dissolved oxygen to produce water. No rational explanation has been provided that supports a motivation to incorporate the teaching of Bianchi *et al.* that is directed to reactively removing dissolved oxygen by controlling an applied current through an electrolyzer. Indeed, the device disclosed by Bianchi *et al.* operates under principles that significantly differ from the operating principles of the device disclosed by Sato or even the device disclosed by Briggs. Thus, a person skilled in the art would not have been motivated to modify Sato's allegedly typical electrodeionization device, or Briggs' electrolytic water softening device, to remove dissolved oxygen by controlling applied current.

To be sure, a person skilled in the art would not have combined the teaching of Briggs with the teaching of Bianchi *et al.* because the reactions disclosed in the cathode compartment of Briggs' device differ from those in the cathode compartment of the Bianchi *et al.* device. That is, Briggs teaches electrolytically raising the pH of the water in the cathode compartment, presumably by generating hydroxyl species or by promoting removal or transport of hydrogen ions from the cathode compartment into the anode compartment, whereas Bianchi *et al.* teaches electrolytically generating hydrogen ions, which can react with dissolved oxygen. Thus, one skilled in the art would have recognized that applying the techniques disclosed by Briggs would

render the device disclosed by Bianchi *et al.* entirely inoperable. Conversely, one skilled in the art would also have recognized that applying the techniques disclosed by Bianchi *et al.* would render the device disclosed by Briggs inoperable.

Therefore, the alleged *prima facie* case of obviousness is improper because, even if the teachings of the references could have been combined, one skilled in the art would not have had any reasonable expectation that the combination would have been successful. Further, the *prima facie* case of obviousness is also improper because the alleged combination would have failed to recite each and every limitation recited in each of independent claims 1, 6, 18, and 28.

For at least the same reasons mentioned above, the subject matter of each of dependent claims 2-5, 7-17, 19-27, and 29-32 would also not have been obvious over the teaching of Sato in view of the teachings of Briggs and Bianchi *et al.*

Accordingly, reconsideration and withdrawal of the rejection of claims 1-32 under 35 U.S.C. § 103 is respectfully requested.

Conclusion

In view of the foregoing Amendments and Remarks, this application is in condition for allowance; a notice to this effect is respectfully requested. If the examiner believes, after this amendment, that the application is not in condition for allowance, the examiner is requested to call Applicants' attorney at the telephone number listed below.

If this Response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee occasioned by this Response, including an extension fee that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 50/2762.

Respectfully submitted,
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